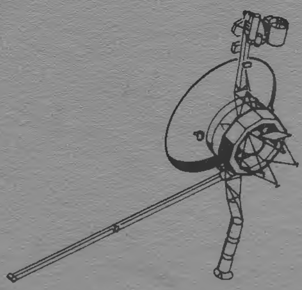


# MISSION STATUS BULLETIN
# VOYAGER

October 20, 1977 — No. 10

## SUMMARY


Voyager 1 is 39 million kilometers (24.5 million miles) from Earth, cruising at a velocity of 40,190 kilometers (24,975 miles) per hour, forty-five days after launch. One-way communication time is 2 minutes 11 seconds.

Sixty-one days after launch, Voyager 2 is still ahead of its pursuing companion ship, 48 million kilometers (30 million miles) from Earth, traveling at 34,870 kilometers (21,670 miles) per hour. One-way communication with the craft now takes 2 minutes 40 seconds.


## MISSION HIGHLIGHTS

### Comet Kohler Observation Opportunity

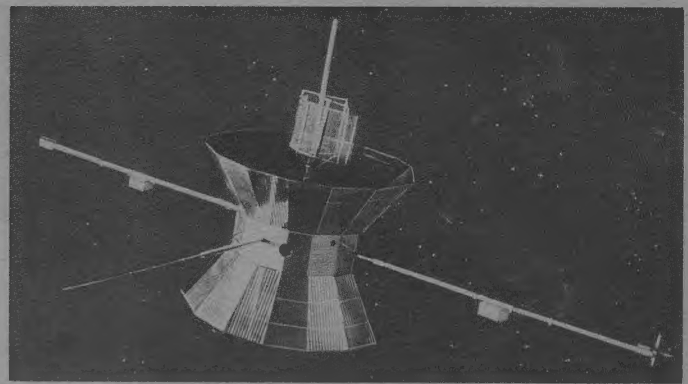
In the latter part of this year, the Voyagers will have the opportunity to study the recently detected comet, Kohler.

Kohler appears to be in a hyperbolic orbit inclined about 49° from the ecliptic plane. Its closest approach to Voyager 1 is expected to be November 8 at a distance of 1.28 AU (1 AU = 150 million kilometers or 93 million miles), and to Voyager 2 on November 10 at 1.25 AU. The comet will pass closer to Earth, about 1 AU, on November 10, but better scientific measurements and longer study times will be obtained from the spacecraft.

### Hydrazine Conservation Studies

Both spacecraft are consuming more propellant than predicted. The causes include trajectory correction maneuver (TCM) thruster plume impingement, solar pressure effects reaction to digital tape recorder start/stop, and scan platform. motion. Studies are underway to determine propellant needs for the duration of the mission versus that available, and to determine what conservation measures are possible.

Preliminary estimates show that neither the primary Jupiter/Saturn mission nor the Uranus option is jeopardized.



HELIOS. Helios and Voyager will cooperate to gather solar-related data during the latter part of 1977.

### Voyager-Helios Cooperation

Voyager and Helios, a German-managed spacecraft project which studies the area between the Sun and the Earth, will join in international cooperation to take advantage of a unique radial alignment of the Sun, the Helios spacecraft, the Earth, and the Voyager spacecraft to obtain data on solar-related fields and particles phenomena.

During the period between October 15 and late December, 1977, the 30-meter antenna at Weilheim, Germany, will track the Voyager spacecraft as often as once a day.

Helios 1 was launched on December 10, 1974 and Helios 2 on January 15, 1976, both from Cape Canaveral, Florida aboard Titan IIIE/Centaur launch vehicles similar to those which boosted the Voyagers aloft this fall. Both Helios spacecraft orbit the Sun, passing as close as 1/3 AU and continuously gathering scientific data.

### Visit by Prince Charles

Prince Charles, heir to the throne of Britain, will visit Mission Operations at the Jet Propulsion Laboratory on October 27. The prince, an accomplished pilot, will tour the Laboratory, view Voyager operations, transmit a command to Voyager 2, and communicate with the Australian tracking station.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National Aeronautics and Space Administration

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# SPACECRAFT SUMMARY

### VOYAGER 1

#### Video Playback

On October 7 and 10, most of an Earth-Moon video sequence recorded on September 18 was played back to Earth from Voyager 1's on-board tape recorder. Portions of the sequence have yet to be transmitted to Earth.

The photographs, taken at 18 different pointing positions with three color filters, have been sent to JPL's Image Processing Laboratory for mosaicking and combination of the sets into color composites.

#### Trajectory Correction Maneuver 2

Voyager 1's second trajectory correction maneuver is scheduled for October 29. This maneuver will compensate for the impingement-caused undervelocity resulting from the first correction on September 11 and 13, as well as correct small expected launch errors.

### VOYAGER 2

#### FDS Tree Switch

An effort to reset the flight data subsystem (FDS) tree switch, which failed September 23, was performed on October 10 and was unsuccessful. The problem is now considered a permanent hardware failure, and "work around" alternatives are under study.

The failure affects 15 separate engineering measurements, an internal FDS measurement, and four redundant measurements.

#### Trajectory Correction Maneuver 1

Voyager 2's first trajectory correction maneuver (TCM) was performed on October 11, achieving the desired correction within one percent.

In anticipation of experiencing a similar thruster plume impingement to that observed on Voyager 1's first TCM, an overburn and pitch turn adjustment were incorporated into the sequence.

#### Deneb Acquisition

Plans to roll the Voyager 2 so that the star tracker uses the star Deneb as a reference have been made for October 31. Deneb lies on the opposite side of the spacecraft from Canopus, and acquiring this star will effectively turn the spacecraft upside down. The benefits will be to minimize the effect of the solar pressure which is contributing to the frequent attitude control thruster firings to steady the ship, and to allow an earlier pointing of the high-gain antenna to the Earth.

# THE VOYAGER SPACECRAFT

*(This is the first in a planned series of brief explanatory notes on the spacecraft and its instruments.)*

#### Part I — The Bus

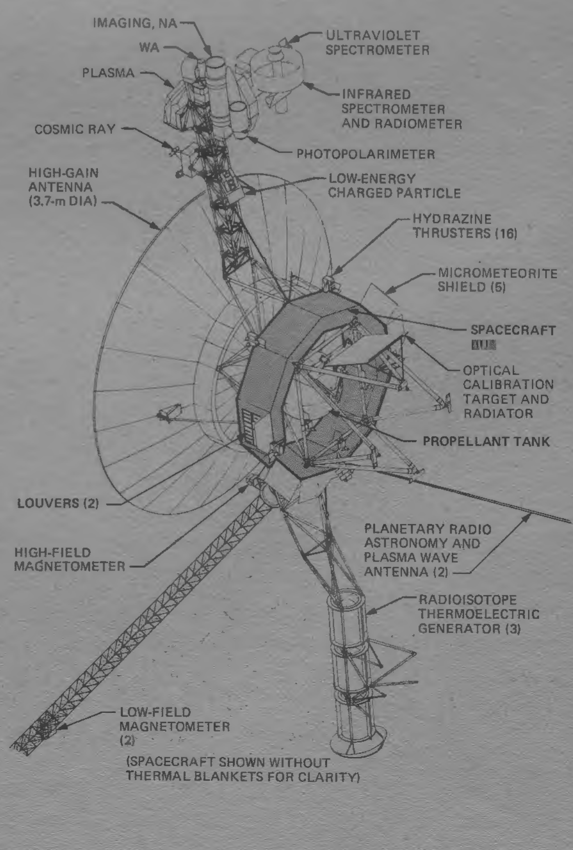
The identical Voyager spacecraft were designed and built by the Jet Propulsion Laboratory (JPL), Pasadena, California, which also designed and built planetary explorers of Mercury, Venus, and Mars, including the Mariners and Viking Orbiters. The design philosophy, taking into consideration the unfriendly environment of space, the long duration of the mission, and the great distances to be traveled, relies heavily on redundancy, reliability, and thermal protection.

The basic structure of each craft is the bus, a 24.5-kilogram (54-pound) ten-sided aluminum framework ring with ten electronics packaging compartments. The bus is about 45 centimeters (about 1-1/2 feet) high and 179 centimeters (about 6 feet) across.

The bus houses the electronics assemblies, including the three on-board engineering computing subsystems — the flight data subsystem, the computer command subsystem, and the attitude and articulation control subsystem.

Two faces of the decagonal bus contain thermostatically-controlled louvers which regulate the heat radiated from the main equipment compartment. Top and bottom of the structure are enclosed with multilayer thermal blankets.

The propellant tank, which supplies fuel to the hydrazine thrusters for attitude control and trajectory correction maneuvers, occupies the center cavity of the decagon.



(SPACECRAFT SHOWN WITHOUT THERMAL BLANKETS FOR CLARITY)